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A political economy of niche-building: Neoliberal-developmental encounters in photovoltaic electrification in Kenya

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ABSTRACT

International agreements on energy access and climate change, formulated according to neoliberal orthodoxy, will drive significant finance to developing countries for clean technology investments. But critics call for more active state intervention – a developmental approach – arguing that free markets alone will not deliver what is required. This creates the potential for confrontation between contradictory ideologies in national policymaking and implementation: neoliberalism in global agreements versus developmentalism in national policy.

The Kenyan photovoltaics (PV) market has long-experienced neoliberal-developmental policy interactions, reflecting on which can illuminate how such encounters might unfold in the future. We construct a new 'niche political economy' theoretical framework to analyse these past interactions, constituting one of three contributions we offer. The second is empirical, showing how PV practitioners, national policymakers and global development actors have negotiated their policymaking encounters over time. Our third contribution offers reflections on the issues explored, discussing what this might mean for future neoliberal-developmental encounters.

We find that action on the ground will emerge from messy negotiated interactions between competing ideologies rather than be determined by powerful neoliberal actors. As such, realising global energy and climate ambitions becomes even more uncertain unless long-term active niche-building resources are secured in international agreements.

1. Introduction

International agreements on sustainable energy access (Sustainable Development Goal, SDG, 7) and climate change are mobilising billions of dollars of finance for technology transfer to the Global South [1–3]. But the emphasis on 'hardware-financing' to achieve their goals reproduces neoliberal orthodoxy [4]. Any public sector role is confined to regulatory functions, such as creating an enabling environment for clean energy technology markets to grow [5,6].

However, innovation scholars argue that financing technological hardware alone is inadequate for achieving successful technology transfer to developing countries [4]. Relevant capabilities also need nurturing [e.g. 7,8], and longer-term development requires building well-functioning innovation systems [9]. Entrusting these nurturing and building processes to the vagaries of free markets merely entrenches existing static comparative advantages [10], marginalising the needs of poor women and men. For sustainable electricity access in developing countries, Ockwell and Byrne [11] demonstrate that decades of active publicly-funded interventions – those going far beyond neoliberal orthodoxy to include capability-nurturing, the building of actor-networks and directed technology-development – were crucial to the widely-acknowledged success of the Kenyan photovoltaic (PV) market [also see 12–14]. Indeed, others demonstrate the importance of an active public sector for achieving successful deployment and development of (especially low-carbon) technologies and capabilities, and innovation system building, in developing countries [e.g. see 15–18]. Therefore, if global energy and climate ambitions are to be realised, there is ample evidence that some kind of developmental approach will be crucial [19].

So, whilst global agreements reproduce neoliberal orthodoxy, national-level realities demand developmental approaches [e.g. see 19,20]. Given the extent of the energy-access challenge, with an estimated 1.1 billion people currently lacking access to electricity

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[according to 2014 data, see 21], neoliberal-developmental policy confrontations are likely to proliferate. As neoliberal orthodoxy remains hegemonic, with "disciplining" power over developing-country states [e.g. see 22], the prospects look poor for creating developmental space [23]. If analysts are to offer insights for realising socially-just achievement of global energy and climate ambitions, it is important to understand how past neoliberal-developmental encounters have played out. In support of this, we analyse the evolution of the aforementioned Kenyan PV market, which is a case rich in neoliberal-developmental encounters.

The question driving our analysis is "how have interactions between global development actors, national policymakers and local practitioners influenced material development of the Kenyan PV market?" We maintain the Ockwell and Byrne [11] conceptualisation of the Kenyan PV market and associated actor-network as a socio-technical niche, but synthesise the conceptual approach with a political economy perspective based on discursive institutionalism [e.g. 24]. This 'niche political economy' theoretical framework enables us to examine the neoliberal-developmental encounters in the Kenyan PV niche and how these have shaped niche-building efforts to date.

Our theoretical framework constitutes the first of three contributions the paper offers. The second contribution flows from applying this framework to the Kenyan case, which reveals the evolving political strategies deployed by different actors – PV niche, Kenyan state, and international donors – in constructing their respective interests through negotiations to mobilise resources for innovation experiments. We find that neoliberal hegemony has so far not been deterministic of niche evolution. However, recent iterations of Kenya's energy policy imply that niche, state and international development actors are converging on a consensus that is more clearly neoliberal. If this consensus holds there are risks the Kenyan niche will wither even as its PV market thrives. For our third contribution, we discuss the implications of our findings for future neoliberal-developmental encounters. Our case illustrates that action on the ground will emerge from messy negotiated interactions between competing ideologies [25] rather than be determined by powerful global forces such as neoliberalism [but see 22]. As such, realising global energy and climate ambitions becomes even more uncertain unless long-term active niche-building resources are secured in international agreements.

In Section 2, we develop our theoretical framework and explain our methodology in Section 3. The case study is presented in Section 4. In Section 5, we discuss the case and reflect on what it could mean for future neoliberal-developmental encounters. Section 6 concludes with a brief summary.

2. Theoretical framework: a political economy of niche-building

We locate our paper in the strategic niche management (hereafter, niche theory) literature on sustainability transitions; a literature that analyses both past and presently-unfolding socio-technical change with the intention of understanding how to guide it in more sustainable directions [26]. Niche theory analyses how novel socio-technical 'solutions' to sustainability challenges develop so as to replace dominant (unsustainable) socio-technical systems: e.g. how renewable energy-based systems replace fossil-fuel-based energy production and consumption. However, the sustainability transitions literature is predominantly Eurocentric [e.g. 11,19,23,27], and has long and repeatedly been critiqued for its techno-managerialist analysis of transitions [e.g. 28–30]. Both critiques are now being addressed, with politics and power receiving attention in the Eurocentric literature [e.g. 31–37], and political economy analyses of energy transitions in African contexts also appearing [e.g. 19,22,23,38,39].

Much of the latter Africa-focussed literature combines transition theory's multi-level perspective (MLP) with political economy to understand the role of the state and its relations with labour, markets, and global capitalist forces [39, however, examines how the introduction of electricity impacts village-level power relations]. Nevertheless, there is some engagement with the niche level [22,23] but, concerned with understanding the totality of MLP and political economy dynamics, these analyses cannot examine the detail of niche-building in particular. Ramos-Mejia et al. [27] are concerned more specifically with the politics of niche-building as enacted through socio-institutional dynamics, with illustrative cases in Thailand and India (none in African settings). These contributions all provide useful insights: for example, Power et al. [23], show how the Mozambican state has little developmental space within which to create energy pathways that are not shaped profoundly by international capital and donors; Ramos-Mejia et al. [27] show how different values (as institutions) influence transition efforts such that promoting apparently 'better' pro-poor technologies can actually reproduce inequalities [and, for the mediating effects of socio-cultural processes on energy project development outcomes in India, see 40].

One purpose in this paper, therefore, is to theorise how a 'niche political economy' is constructed around a novel socio-technical 'solution' (off-grid PV) in a development context (Kenya). This can help us understand how encounters between ideologies, actors with different interests, locally-specific energy challenges, policymaking and material developments shape energy pathway construction. In this respect, our analysis speaks to the notion of "energy landscapes" (different to the MLP's landscape concept), described by Power et al. as a set of "dynamic entities constituted by complex local, national and transnational flows of technology, funding and ideologies" [23, p. 12], and the notion of "disciplinary neoliberalism" offered by Newell and Phillips [22], whilst revealing the messy realities of policymaking and its outcomes on the ground [25].

We develop our theoretical framework by drawing on a discursive institutionalist conceptualisation of political economy, examining how this compares with niche-theory concepts. Our discussion is structured according to the three categories of discursive institutionalism – ideas, interests and institutions – within each of which we consider how niche-theory concepts are related. It is important, therefore, to begin with a summary of niche theory so that the discussion of how the various concepts of each framework relate to each other is meaningful.

2.1. Niche theory in brief

A socio-technical niche is a protective space for learning about new innovations (e.g. solar home systems, SHSs) in social context [41]. Protection prevents the innovation from facing normal market pressures while it develops to compete with the currently-dominant technology in its socio-technical 'regime' (e.g. fossil-fuel-based electricity provision and consumption) [42]. A niche consists of the innovation and the empirically-identified actors who are working to develop it, and so is different to a market, which is an outcome of the exchange of money for goods and services. The niche provides opportunities to: (1) generate learning from innovation experiments in context; (2) build widening networks of actors, who bring resources to niche-evolution; (3) develop robust expectations for guiding actors' learning; and (4) institutionalise new socio-technical practices [11]. Socio-technical experiments, and processes and events, are key sites for learning, and so we capture this range (experiments, processes, events) in the term 'encounters'.

2.2. A discursive institutionalist political economy and niche theory

We reinterpret niche theory through a discursive institutionalist political economy lens [e.g. 24] that, following Kern [33], consists of three co-productive categories: ideas, interests and institutions. Ideas evolve and can be traced by analysing the discourse on the issue of focus. Interests are emergent rather than self-evident to actors, especially in situations of complexity and uncertainty such as in socio-technical niche-building. And institutions are rules – formal or informal

– that constrain or enable actors' agency, and can be adjusted, created or discarded. We work through each of these three categories below, discussing how they intersect with niche-theory concepts, finishing each category-discussion with a summary of what this means analytically.

2.2.1. Ideas: narratives, expectations and learning

We can see ideas discussed, contested, and so on, in the narratives that constitute a discourse [33,43,44]. As such, we can reveal ideas relevant to a specific political economy by identifying and analysing the narratives at play in debates about particular socio-technical niche-building (or stifling) efforts. Development narratives discipline the complexity of the world by simplifying it into plausible stories [45] and, through framing, place in view certain aspects of the world while hiding others. A narrative defines a current development problem, elaborates how to fix it, and describes the expected outcome if the fix is successful: a problem-strategy-outcome narrative-construction [43]. But a narrative is not automatically plausible. Naess et al. [46, p. 536] argue that "narratives and evidence [provide a way to examine] the histories and practices linked to shifting discourses, and how these shape and guide policy problems and courses of action", implying plausibility derives from interdependencies between present narrative-construction and historical evidence. That is, for plausibility in a particular context, a narrative must appeal to context-specific qualities of local[1] culture, politics, history, economy, etc. For persuasiveness, it must link with other locally-powerful narratives, or what Raven et al. [47, p. 168] call "prominent socio-political agendas".

Wagenaar [48] argues that a narrative achieves appeal by being both subjective and value-laden. A 'good' narrative subjectively engages universal themes, reflecting readers' own life-experiences and enabling them to complete missing details. Readers recognise the characters and their ambiguous situations, and wrestle with the situations' moral complexities. A 'good' narrative is value-laden by depicting its characters in ways that persuade readers to make judgements: the characters are good or bad, right or wrong, etc. The reader will thus want the 'good guys' to win; to support their strategies above others. So, to compel the reader to choose sides, the narrative presents a moral dilemma that threatens the normal order of things; a dilemma caused by the 'bad guy(s)'. To restore order, someone must act: the good guy (s), or the bad guy(s) turned good.

In niche theory, expectations convey ideas about future socio-technical configurations [e.g. 49,50]. They are deployed politically to persuade others to adopt the same expectation [51], achieve legitimacy for an innovation, secure resources, and build alliances to reform key institutions [37]. In the context of a shifting discourse and prominent socio-political agendas, an expectation must evolve to maintain its persuasiveness if it is to succeed politically. As such, learning is crucial. Niche actors will thus draw strategically on learning to maintain the salience of expectations [52]. So, expectations overlap conceptually with narratives; and learning underpins their evolution. We can, therefore, trace evolving expectations through narratives, observing how learning and narratives co-evolve; analysing them in terms of framing, their problem-strategy-outcome construction and the moral dilemmas they depict. We thus have a way to explain the work of ideas in a political economy of niche-building.

2.2.2. Interests: constructing hard and soft materiality under conditions of uncertainty

Interests and politics form the "core of classic political economy analysis [which emphasises] the interactions of state and civil society, and different interest groups, social segments or classes" [46, p. 536]. In classic political economy, actors are personal-utility maximisers who rationally pursue their known interests. But, under conditions of complexity and uncertainty (e.g. in innovation experiments), actors' interests are not self-evident [33,53]. Rather, actors construct interests while negotiating discourses and navigating opportunities for action. Actors may have knowable material interests, including 'soft' materiality such as capabilities, but it may be unclear how these interests will feature in any realised future and, therefore, whether they will continue to be interests. Thus we should attend to how interests co-evolve with narratives, institutions, materiality and context.

Niche experiments offer spaces in which to observe interest-construction [54]. Experiments create material artefacts (e.g. SHSs) as well as other 'hard' materiality (e.g. project funds). But 'softer' materiality also emerges from encounters: e.g., actors develop capabilities around specific technologies [e.g. see 55, on Kenyan solar technicians]; build actor-relations through which they gain resources [56]; refine business models that become profitable [e.g. see 13, on Kenyan pay-as-you-go PV]; or recruit support to change institutions that further their interests [37]. Through these hard and soft materialities, actors can discover, establish, (re)construct, maintain, and enhance their interests. As they do so, they will promote changed expectations, and so we should see changing narratives as well as changing materialities.

2.2.3. Institutions: agency and the construction of rules

When analysing agency, institutions are relevant. As stated above, institutions are formal and informal 'rules' that enable or constrain agency [33]. Formal rules include policies, laws, regulations and technical standards; informal rules include social norms, cultural practices, values, and so on [57]. Institutions do not determine agency but when actors wish to go beyond what institutions enable they must do political work to persuade others it is acceptable or desirable, or risk illegitimacy [37,53]. Tracing narratives, therefore, allows us to see how actors are attempting to change institutions, in what ways and to what ends.

Niche theory defines institutions in the same way as above and, as Raven et al. [37] argue, understands that institutional change requires political work and alliance-building, implying the need to extend actor-networks. Actor-networks evolve through various encounters that generate learning about enabling and constraining institutions [51], and actors deploy this learning strategically to adjust their narratives when arguing for institutional changes to promote their interests. In addition to their persuasiveness, the success of narratives will depend on who is promoting them (and which resource-holding actors are listening) [47]. The institutional position of narrative-promoting actors is therefore important: formal institutional position (e.g. politician, official, cleric, NGO), or informal position (opinion-leader, elder, head of household). These positions provide political resources and so can be seen as 'soft' material interests. Thus, as with ideas and interests, narratives are central to shaping a niche political economy, operating recursively with interests, institutions, materiality and context.

2.3. Summary

Table 1 provides a summary of how niche theory concepts relate to the political economy categories of ideas, interests and institutions. And Fig. 1 depicts the main concepts we use to form the framework of our niche political economy perspective, indicating their co-constructive dynamics. Having developed our theoretical framework, we move in the next section to present our methodology.

[1] Local, here, does not have to mean a sub-national region or nation. We are using it in the sense that those who the teller wants to persuade are the locals in that 'space' – the relevant audience. So, the UNFCCC Conference of the Parties, for example, might include thousands of people from across the world but there will still be policy narratives told within this 'locality' that connect with other narratives relevant to the 'culture', 'language', 'politics', etc., of the UN negotiations.

Table 1
Conceptual links between political economy and niche theory.
Source: Authors.

Political economy	Conceptual links with niche theory
Ideas	Expectations reveal ideas about socio-technical futures, expressed in narratives, moral dilemmas provide persuasive forces Evolution of expectations, and encounters with other expectations, reveal politics and actors' strategies
Interests	Experimentation and learning reveal how interests are constructed in the face of uncertainty and change, and how interests are materialised Evolution of actor-networks reveals shared interest-construction and the nature of resources sought and secured Expectations are suggestive of interests and interest-construction (perhaps implicit through framing, for example)
Institutions	Institutionalisation reveals actors' agency and constraints, traces institutional change Expectations reveal the politics of institutional change

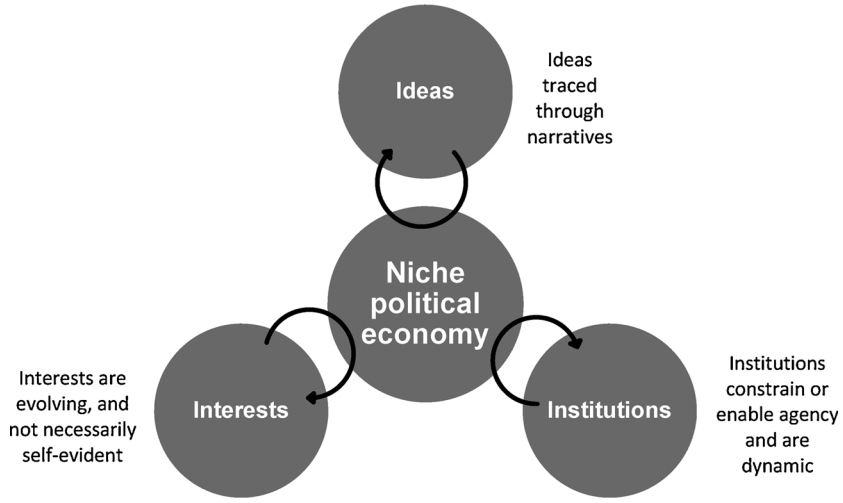

Fig. 1. Niche political economy co-produced through evolving ideas, interests and institutions.
Source: Authors' construction.

3. Methodology

3.1. Case selection and research question

We focus on the off-grid SHS niche in Kenya, a useful case study for two main reasons. First, SHSs are widely viewed as important for facilitating sustainable electricity access. Second, the Kenyan PV market is considered one of the most successful per-capita off-grid solar markets in the developing world [13], widely described as an unsubsidised private-sector-led phenomenon [e.g. see 55,58], and so could be seen as a neoliberal development exemplar. However, Ockwell and Byrne [11] argue this 'private-sector-led' characterisation is highly simplified. Donors have long-provided niche-building resources for PV actors in Kenya, without which there may be no PV market [11,14,51].

The case, therefore, is an example with a history of encounters between international donors, supportive of neoliberal development orthodoxy, parts of the Kenyan state, and PV activists promoting SHSs for pro-poor off-grid electricity-access. Understanding these encounters, and how PV pathways have been constructed through them, can generate insights relevant to global energy and climate ambitions. Given the enormous flows of private finance expected to realise these ambitions, and that an active public sector may be needed to guide, direct and even lead investment [59–61], the number of neoliberal-developmental encounters will likely proliferate. We use our niche political economy framework to understand how these encounters have played out in Kenya, and for reflecting on how they might play out more generally in future. To do so, we seek to answer the question "how have interactions between global development actors, national policymakers and local practitioners influenced material development of the Kenyan PV market?"

3.2. Strategy and methods

Gathering empirical material for more than a decade, we have developed a detailed innovation history of the Kenyan PV niche [see, especially, 11,51,62]. In addition to desk-based work, the bulk of field research underpinning this was conducted during three separate periods: July 2007 to July 2008, May to August 2013, and June to December 2016. Altogether, this includes over one hundred hours of interview testimony, and two stakeholder workshops conducted in Nairobi. For this paper, we revisited our innovation history, identifying moments where political economy dynamics were most likely evident. Based on our theoretical framework, such moments would be those with observable changes to narratives, institutions or material interests. Each of these could signal political economy dynamics in operation. From these moments, we selected a sample for further desk-based research, a reinterpretation of material already collected and new interviews.

We conducted nine new interviews (between June and December 2016) to elicit information relevant to the political economy of the selected moments: two international NGO representatives, two private sector representatives, and five senior county government officials. These were semi-structured interviews based on questions that operationalized our theoretical framework (see the supplementary material for these questions). We also sought new documentary material. For one selected 'moment' – the Institutional PV Systems Programme (IPVSP) discussed in Section 4.3 – we were unable to secure any interviews despite many attempts to do so. We did, however, draw relevant data from the annual Sector Reports 2010–2018 (prepared by the Kenyan National Treasury), supplementing the information we already had from our previous research.

We analysed the material using the questions given in the

supplementary material to this paper. The innovation history was examined according to phases, where each phase was identified in line with the selected moments for political economy dynamics. Then, we reconstructed the history, writing notes for each of the categories ideas, interests and institutions. For the ideas category, by applying the problem-strategy-outcome structure together with associated framings and explicit or implicit moral dilemmas, we identified the narratives deployed by the main actors (international donors, Kenyan state actors, and PV activists). The notes for each of the three categories were then synthesised to construct a historical account of the political economy of Kenyan SHS niche-building, recounted in Section 4.

For the identified narratives, we chose labels that were simple and descriptive of what we considered to be a defining characteristic of each. We identified three main narratives in operation: market-failure, knowledge-gap and enabling-environment. The rationale for each of these names is explained when they arise in the case study, along with explanations of their constituent elements (structure, framing and moral dilemma). We concentrate attention on the narratives of Kenyan state actors and PV niche practitioners, as neoliberal development orthodoxy remains relatively stable throughout except for a shift from its Washington Consensus Mark 1 to Mark 2 versions [6].

3.3. Key terms: neoliberal and developmental approaches

We take 'neoliberal ideology' to mean the twin-belief, as Radice [63] expresses it, in self-regulating markets and minimal state intervention in the economy. The Washington Consensus embodies this ideology, even if it has evolved into what Woo [6] calls a Mark 2 version in which the state plays a bigger role: i.e. the change from self-regulating (Mark 1) to state-regulated markets (Mark 2) [cf Wade, 64, who argues there is no Mark 2]. We take 'developmental ideology' to mean a belief that the state *must* be active in the economy if a nation's economic development is going to achieve more than exploitation of current comparative advantages. Following, for example, Reinert [10,65], a major problem with neoliberal ideology is that free markets (especially free trade) lock poor countries into low value-added economic activities. Poor countries, the argument goes, need structural economic change in order to escape poverty and this is only possible through state-intervention: i.e. a developmental rather than neoliberal approach [e.g. 19,64]. Whilst it is beyond the scope of this paper to debate the specifics of these ideologies, the evidence and analysis of the Kenyan case (presented in the next section) suggests that realising energy transformations of the kind anticipated by global policy ambitions will need some kind of developmental approach.

4. Case study: a political economy of Kenyan PV niche-building

Quickly established in the mid-1980s [66], the Kenyan SHS market has long been celebrated as an unsubsidised private-sector-led success [14], with over 320,000 SHSs sold (see Fig. 2) [58]. However, our account of its evolution reveals a more complex array of dynamics than the 'private-sector story' suggests [for a fuller history, see 11]. Using our 'niche political economy' framework, we see how actors with different development strategies have negotiated their mutual encounters through technology experiments and policymaking to build this 'niche'. We present the case around three key narrative developments, providing within each a descriptive subsection followed by analysis. Before presenting the first of these narrative developments, we sketch the beginnings of the SHS notion itself, and its emerging market.

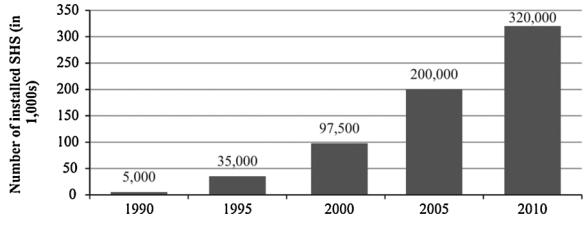

Fig. 2. Number of SHSs installed in Kenya 1990–2010.
Source: Ondraczek [58, p. 409].

The SHS[2] market began in a series of four PV lighting installations in schools around Mount Kenya, during 1984–1986 [67]. Harold Burris and Mark Hankins (both US nationals but living in Kenya at the time) led the installations, the first of which was at Karamugi Harambee Secondary School. Following consultations with the Peace Corps, the subsequent three installations were part-funded by USAID (50%) and part-funded by the schools [11]. After each of the four installations, the headmaster and teachers wanted systems for their homes [68] and thus the SHS concept was born. During the USAID-supported installations, about a dozen technicians were trained and Burris employed many of them in the SHS business he started as a result of seeing the response to the school installations [67]. The other technicians were employed by the Nairobi PV suppliers, and marketing of SHSs then got underway around Mount Kenya [11]. Precise figures are impossible to determine, but the market grew quickly in the next few years, with Hankins [66] estimating there were 500 SHSs installed by early 1987 [but also see 69,70]. Much of the business flowed through Burris' company, but he became isolated from other actors in the niche – he was critical of those using poor technical practices, making enemies – and found it difficult to operate his business. Around the end of 1987, he left Kenya, as did Hankins (for different reasons) [11].

4.1. The work of an enduring PV story

4.1.1. Constructing a narrative, building a niche

Returning to Kenya in 1990 to conduct research for his MSc dissertation, Hankins found a flourishing SHS market [67]. He surveyed installations, discovered how customers were using their systems, how the supply chains were working [66], and identified problems in the market: poor-quality hardware and poor user-practices. Despite the problems, 4000 systems had been sold, prompting him to write perhaps his first attempt to construct a story of this PV market phenomenon, saying "The phenomenal growth of the Kenyan market has occurred almost entirely on a commercial basis, as external aid has not played an important role in dissemination of home lighting systems, except for training projects involving rurally-based electricians" [66, pp. 2–3]. According to Hankins [67], this "message" was "picked up by the World Bank"; perhaps referring to a later International Finance Corporation (IFC) project to scale-up the market (discussed in Section 4.2). More immediately, Hankins used his findings to win funding for research into SHS markets in Kenya and elsewhere, publishing these in 1993 and 1994 [see 68,71], and writing a textbook of SHS design [first published in 1991, updated in 1995 and then in 2010, see 72–74]. Together with Burris and others, he won funding for a PV training workshop in 1992 [11], sparking new project opportunities. He then started Energy Alternatives Africa[3] (EAA), which became a leading player in the Kenyan PV market.

EAA used Hankins' private-sector story to win donor-funding for PV projects over the ensuing years. They would identify a market-problem and argue this was preventing private sector actors from developing the market. Donor-funding would support an intervention to solve the problem. This strategy was successful, winning resources for many projects. Donors who funded these included the Commonwealth Science Council, Sida, APSO, Hivos, Ashden Trust, Energy Sector Management Assistance Programme, Micro-Enterprises Support

[2] The term solar home system had not been coined at the time but we use it here for simplicity.

[3] EAA has gone through changes of ownership and name, including Energy for Sustainable Development and Camco Advisory Services. We use EAA here for simplicity. Hankins left the company in the mid-2000s, after which he started African Solar Designs.

Programme, the World Bank, and the UK Department for International Development (DfID). There is no space to detail these projects [see 11,51] but they included funding, amongst others: a Tanzanian solar training facility and courses; technology-development and test-marketing (e.g. lanterns and solar batteries); market surveys; micro-finance experiments; and an alternative Kenyan energy policy process. Through these and other projects, and working with many actors, EAA helped build the niche's actor-networks. According to Ockwell and Byrne [11, p. 98], from 1995 to the early 2000s, EAA worked "with at least 39 different dealers and suppliers in 16 cities, towns and villages around Kenya, and at least five of the dealers were involved in more than one project". EAA also worked with local manufacturers and foreign researchers, and Hankins established SolarNet in 1992, a local PV actor-network [12]. From 1990 to the early 2000s, Hankins and colleagues repeated the private-sector story, but acknowledged donor-support[4] for training. The story has endured, with Hankins and colleagues using it to successfully attract resources to support their vision of SHS market development.

4.1.2. Political economy of niche-building

Applying the problem-strategy-outcome structure, we can abstract the generic narrative PV actors used. The generic problem-definition could be 'there is market-failure preventing SHS market growth'. In this 'market-failure' narrative, the generic solution-strategy was to 'use donor-funding to correct the market-failure'. The outcome would be 'a growing SHS market providing electricity-access and development'. As we discussed in Section 2, a narrative must be contextualised in terms identifiable to its audience (e.g. donors), which can be done by framing and by infusing the narrative with a moral force. The market-failure narrative is framed using the private-sector story. Here, without assistance, private sector actors created a PV market. The frame includes: individual actors; individual behaviours; technologies; policies; costs, prices and markets; and supply chains. Excluded – explicitly or implicitly – are collectives: collective provision of electrical services; public sector; social goals; and politics and culture. The narrative's moral dilemma is 'the normal order of increasing electricity-access through a private market is being disrupted by a market-failure'. On each side of this dilemma are 'good guys' (private sector actors, potential users, market forces) and 'bad guys' (a market-failure). We should thus correct the market-failure to help private sector actors.

Free-market orthodoxy underpinned donor-thinking when EAA began looking for project-funding. The market-failure narrative married EAA's diagnosis of market-needs with free-market orthodoxy. Development actors (e.g. the World Bank) would identify sympathetically with the narrative's moral dilemma and market-failure diagnosis. Moreover, the system-framing is neoliberal (atomistic) – (heroic) individuals, behaviours, technologies, etc. – and a specific constraint is described. With a market-failure identified, and market-correction suggested, a targeted intervention becomes attractive and actionable.

The private-sector story's plausibility was likely assisted by the early 1990s' rapidly-growing market, providing Hankins with evidence he could deploy [e.g. 66,68,71]. It is unclear whether PV niche actors believed the market-failure narrative or merely deployed it politically. In a sense, it is not important; *in effect*, it worked politically. It persuaded donors to direct resources into the niche, over a long period, enabling extensive niche-building. Thus, the narrative and interventions created a virtuous circle. Attempts to fix 'market-failures' seemed to work, making it easier to attract funding to fix other 'market-failures', all the while providing the convenient fiction that the market was unsubsidised thereby strengthening the veracity of the market-failure narrative.

As a result, niche actors constructed hard and soft interests. Hard interests included the Tanzanian solar training facility, project funds and the livelihoods these afforded, profits, and customers' SHSs. Soft interests included the capabilities developed (SHS knowledge, proposal-writing, project management, etc.), expanding actor-networks and actor-relations, and EAA's accumulating political resources as a leading niche actor. And we see institutionalisation, including spreading technical practices through training and technician-manuals, emerging informal user-practices (good and bad), efforts to strengthen market institutions such as micro-finance, and some successes and failures to reduce taxes on PV equipment (see below).

4.2. A shifting narrative: market-failure to enabling-environment

4.2.1. Neoliberal orthodoxy encounters niche realities

During the early 1990s, the Global Environment Facility (GEF) and the IFC decided to scale-up the Kenyan PV market, developing a proposal for market transformation [75]. The proposal referred to a "true free market for PV products" [76, p. 12], suggesting they had adopted the Kenyan niche's private-sector story. In July 1998, implementation of the Photovoltaic Market Transformation Initiative (PVMTI) began [76,77]. Over ten years, PVMTI intended to make USD 5 million available to finance demand and supply-side interventions: customer-finance to overcome the initial cost of PV modules; supplier-finance for purchasing in bulk to reduce costs and lower prices to customers.

Although PVMTI identified other issues hampering development of the PV market – e.g. capacity-building needs, poor-quality products [77] – effort focussed on establishing finance deals. However, deal-negotiations were protracted, perhaps crowding-out provision of other support services, and ultimately fruitless [see 51]. Only one deal actually financed SHSs: USD 600,000 agreed with the Muramati Tea Growers Savings and Credit Cooperative [51]. But this fell apart when implementation started [62]. Following a "very bitter" meeting with Muramati stakeholders [78], the project ended with only 150–170 SHSs financed [75].

PV actors lost patience and disparaging letters appeared in SolarNet's magazine [e.g. 79–81]. Eventually, they discussed other ways PVMTI could provide tangible benefits [82]. This led to a restructuring of PVMTI [75,78,83] and, in June 2006, the Kenya PV Capacity Building Project (KPVCP) got underway [84] with a grant of USD 350,000, together with "in-kind contributions and co-financing" of USD 115,000 [75, p. 42]. KPVCP supported the recently-formed Kenya Renewable Energy Association (KEREA), PV curriculum development, training courses, production of three manuals (for users, vendors and installers), and a quality assurance programme [75,83,84]. PVMTI was extended to 2011 and, according to Ngigi [78], these efforts redeemed PVMTI's credibility amongst niche actors.

Overlapping with PVMTI, niche actors began interacting with the Kenyan state when, in April 1999, the Kenya Bureau of Standards (KEBS) formed a committee with 12 of them to formulate PV standards [85]. During their meetings, they decided to form an association, thinking it would be "better that the association has its rules and governs itself before the Government comes in and puts its hand into saying all these things and getting licenses" [86]. In August 2002, they registered KEREA. Also, the Acting Director of the Renewable Energy Department in the Ministry of Energy (MOE), Daniel Theuri, collaborated with EAA on papers for a project on regional household energy policy [87–89]. And, in 2002, PV actors, funded by DfID, developed an alternative national energy policy in parallel with the MOE's official process. We examine policymaking in Section 4.3 [for a fuller account, see 11].

Soon after KEREA formed, it appeared its self-governance argument was vindicated. Following systematic testing of several brands of amorphous silicon modules, two were found to be overrated [90]. Based on this, KEREA claims to have pressured the module's importers

[4] Others tend to simplify the story, describing the market as unsubsidised [e.g. 58]. An exception is Jacobson [55], who usefully discusses the subsidy debates of the time. He argues that 'soft' subsidies were acceptable, even to neoliberal policymakers, because they could be construed as market development support in contrast to direct subsidies on PV module prices.

to remove them from the market [86]. This suggested KEREA's code of conduct [91] was working and, according to Loh [86], KEREA's credibility was enhanced amongst state actors. But poor-quality products and practices continued to dog the market and so, in 2008, the KEBS committee began developing PV regulations, abandoning self-governance. Eventually agreed in 2012, the regulations included requirement for practising PV actors to be licensed, with annual renewal fees, and licensing was dependent upon successful completion of nationally-approved testing [92]. Although the license fees are low (zero for the lowest technician-tier), the training course could cost from USD 450[5] to USD 550. For aspiring technicians, this is a serious barrier. Indeed, according to Da Silva et al. [93], recruiting technicians into the licensing process has been difficult, especially at the lowest level.

4.2.2. Political economy of a shifting narrative

Despite the failure of PVMTI, the private-sector story persists. Explaining this entails examining how the market-failure narrative evolved. The narrative shifted from 'market-failure' to 'enabling-environment', reflecting the late 1990s shift in neoliberal orthodoxy from Washington Consensus Mark 1 ("get the prices right") to Mark 2 ("get the institutions right") [6, pp. 12–13]. To some extent, PVMTI embodied this shift. It was initially about reducing PV module prices but became about institutions. Broadly, its capacity building (technical practices as institutions) and support for standards (institutional environment) demonstrate this. But, as we noted, the reality was more complex: the initial focus was on establishing finance models for PV (i.e. financial institutions), not just prices.

Niche actors had long-lamented poor practices, lack of standards and of micro-finance models, so efforts to "get the institutions right" had been dear to them from the beginning. Their encounters with PVMTI, continuing over two to three years [83], afforded ample opportunity for niche actors to adopt enabling-environment orthodoxy. And many were involved with standards-making, in encounters with actors whose work is to create institutions. It is plausible, therefore, to imagine an easy shift from the market-failure to an enabling-environment narrative, without damaging the private-sector story. And, although there is no strong evidence, there is indication that adopting an enabling-environment narrative was, perhaps, a strategic move. Initially, PVMTI was not furthering niche actors' hard interests so institutional change (e.g. PV curriculum, training courses) may have been a way to salvage something. Such institutional changes can be seen as closing-down devices: legitimising some practices and delegitimising others, with consequences for whose interests are served. Likewise, going from standards-making to regulations-setting intensifies this closing-down process [94]. We have some evidence that niche actors understood how this closing-down could impact their interests. According to Mboa [95], deliberations in the KEBS committee included arguments over how long product warranties should be, with state and consumer representatives on one side arguing for lengthy warranties, and private sector representatives on the other arguing lengthy warranties could put them out of business. Indeed, similar arguments were had during the standards process in the early 2000s [85]. Adoption of an enabling-environment narrative may have helped niche actors maintain influence over specific institutional changes so as to minimise damaging their interests.

4.3. Converging narratives and strategic rhetoric

4.3.1. Evolving policy narratives

After encounters in the KEBS committee, niche actors tried to influence energy policy. It is unclear whether these efforts were successful: some developments indicate substantial influence; others suggest influence has been superficial. State *practice* around PV has been variously ambivalent, hostile, supportive or active; official state *policy* has been noncommittal, and occasionally undermining of niche development. We trace here the evolution of official energy policy through its three iterations.

Formulated in 1987, but unpublished, Kenya's first energy policy has two comparatively substantive mentions of PV [96]. Cooking, energy efficiency in the industrial and commercial sectors, and transmission efficiency in the national electricity grid were the policy's focus. The strategy was to promote improved cookstoves and industrial energy conservation, and reduce electric power system losses. As the SHS market was tiny – Hankins [66] estimates there were 500 SHSs in 1987 – state actors were unlikely to pay it much attention. There were supportive statements regarding research, design, development and dissemination (RDD&D) for PV, but the budget for the period 1987–2000 was 0.26% of the total, shared with wind power [96]. Removal in 1986 of 45% import duties on PV equipment was supportive [55,97], but duties were raised again in 1992 (to 53%), reduced during the 1990s to zero in 2002 [55], and 16% VAT was imposed on solar goods in 2013 [11].

This ambivalence changed while developing a new policy, a draft of which was published in 2004 [98]. Deeper encounters between niche and state actors may explain the more favourable official view. Niche actors, funded by DfID, developed an alternative energy policy in parallel with the official process. Although this caused tensions between the two policy processes [11], the official policy adopted some of the PV advocate's views, following pressure from GTZ and UNDP [99]. The PV market was described using the private-sector story, saying "growth is attributable to aggressive marketing by the private sector with limited support from the Government in form of low taxes on panels" [98, p. 31], and the challenges facing the PV market included the market-failures long-articulated by PV actors [54,98]. Although there was acknowledgement of a public sector role (low taxes on panels), donors were not mentioned. Despite this warming to PV, specific promotional strategies were not incorporated. Instead, the policy adopted an enabling-environment approach.

The more PV-friendly view continued into the 2015 energy policy, developed to accommodate Kenya's new constitution. PV-promotion policies are given but in generic statements echoing the 2004 enabling-environment approach (standards, regulations, certified training, consumer information, RDD&D) [100]. The only active instrument introduced between the 2004 and 2015 policies was a PV feed-in tariff (FIT) [101], although this has been criticised for being unattractive and allegedly set low deliberately [22].

Not signalled in the 2004 policy, the MOE began implementing the Institutional PV Systems Programme (IPVSP) in 2005 [103]. According to Ockwell and Byrne [11], it was an *ad hoc* response to pressure on the MOE soon after Mwai Kibaki was elected President in 2002. Kibaki promised, upon election, electrification of the Northeast Region, sparsely-populated arid and semi-arid land with little electricity grid infrastructure. PV systems were the only quick way to fulfil this promise. Whilst there have been problems [104,105] – allegations of rent-seeking amongst state officials and installation companies [99,106] – IPVSP did electrify a large number of schools and other facilities. Fig. 3 shows the results of our data-gathering based on publicly-available information, suggesting 1559 systems have been installed. But other estimates put the figure at anywhere up to 4000 systems [see 54]. The total cost of the Programme is also unavailable but it could be as much as KES 8 billion (approximately USD 100 million) [54].

Considering the state's ambivalence for PV, it is surprising it initiated IPVSP. The President's power likely played a role, forcing the MOE to act quickly, but we were unable to establish the explanation. One observer suggested the Programme was supported because of its scale [107]: at 20W–50W, SHSs are small and so scaling-up is an

[5] The University of Nairobi website advertises various courses on solar PV. A T1/T2 (lowest two tiers of technician curricula) Basic and Intermediate Solar Training course conducted in April 2017 was advertised at about USD 450 for Kenyans and USD 550 for non-Kenyans (see http://physics.uonbi.ac.ke/node/28676, Accessed 13 March 2018).

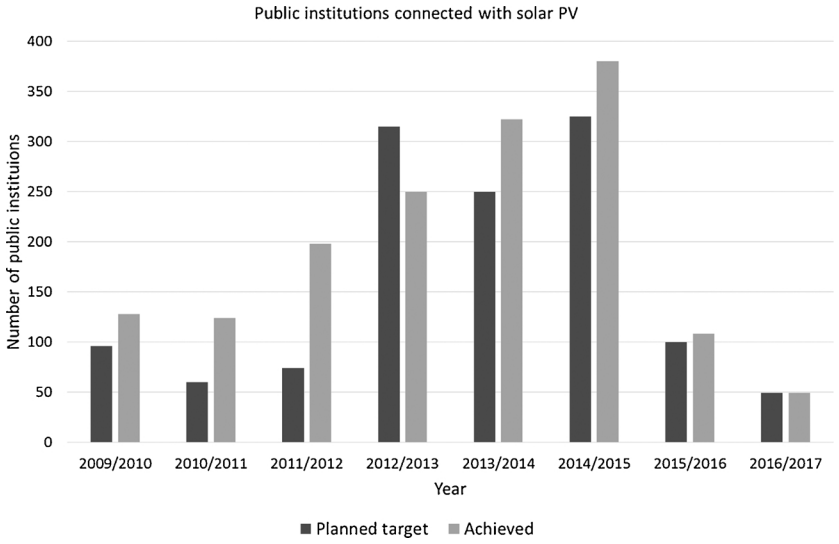

Fig. 3. Number of targeted and installed institutional PV systems.
Source: Compiled from sectoral reports [102].

incremental process with uncertainty about achieving large-scale success; the IPVSP systems are about 1 kW or more, so the aggregate scale is large (megawatts) and its achievement more certain.

4.3.2. Political economy of policy narratives

We can only infer a narrative from Kenya's 1987 energy policy. Uses for PV were acknowledged but it was considered expensive, unfamiliar, immature and risky; the policy was to undertake RDD&D [96]. So, the problem-definition was 'PV has potential but is expensive and its suitability unclear', with a strategy to 'undertake RDD&D'. The outcome would be the 'ministry has more knowledge about PV so can decide on its use', suggesting a 'knowledge-gap' narrative. Included in the frame were the government (national and district levels), off-grid population, PV, institutional environment, the market and private sector actors. Excluded were donors, NGOs and community action. The moral force was weak, derived from the *potential* of PV for development. Here, the normal order of socio-economic development for all Kenyans being pursued by the 'good guys' (government, potentially PV) was being disrupted by the 'bad guys' (cost, ignorance, poverty). Considering the main state audience was likely the finance ministry, the comparative weakness of the knowledge-gap narrative may explain PV's small budget. With minimal resources to deploy, and no compelling case for PV, we can see why the state was ambivalent. So, niche-state encounters were insignificant and little niche-development resulted from state action.

PV continued to be a minor concern in the 2004 policy, although it acknowledged the adoption of about 200,000 SHSs [98] and the narrative was more assured. The problem-definition became 'PV is constrained by the fiscal and regulatory framework', with a strategy of 'establishing an enabling environment to incentivise private sector PV investment'. The outcome would be 'expanding off-grid electricity-access using PV'. So, the state shifted to an 'enabling-environment' narrative, apparently converging with PV actors and neoliberal policymakers. But this convergence may have been strategic. According to interviewees [99,106], GTZ and UNDP pressured state policymakers to include PV-supportive text and so state actors may have seen an opportunity to increase aid-flows.

The frame was similar to the 1987 policy but the moral force was stronger. The 'good guys' had achieved tangible progress: 200,000 SHSs adopted. The normal order of things was being disrupted, amongst others, by high costs, poor-quality equipment and technical practices, theft of modules, and low awareness. With the convergence of all actors on an enabling-environment narrative, it is unsurprising that the policy followed suit: regulatory institutions were restructured, PV-specific regulations were introduced, and PV FITs were set. The 2015 energy policy maintained the enabling-environment narrative, only adding a commitment to complete the IPVSP [100].

Despite the apparently stronger support for PV in the 2004 and 2015 policies, it is difficult to identify evidence that the enabling environment has stimulated material developments in the niche. Rather, the opposite is more apparent, considering the rise of VAT in 2013. Niche actors may have developed soft material interests through their encounters with national and international policymakers – policy-engagement capabilities, actor-relations, credibility – and these may bear fruit in time. But there is a risk sustained encounters with neoliberal policymakers mean niche actors simply become co-opted into neoliberal orthodoxy.

In contrast, the IPVSP has clearly served some hard material interests. Only large companies in Kenya won installation contracts [106] so only some niche interests were served. But the Programme provides electrification for off-grid facilities that otherwise would remain unelectrified so it has furthered the interests of thousands of Kenyans. However, this does not explain why the state, ambivalent to PV, spent billions of shillings on IPVSP. The Programme is misaligned with an enabling-environment narrative; it fits with a developmental one. We have noted the President's power in creating the Programme, and its scale may have been attractive to MOE actors. But these do not explain the *process* between the President's instructions and the Programme's creation. Perhaps the President's instruction forced the ministry to reframe their PV narrative's problem-definition. The President promised to electrify the Northeast Region (geographical reframing) upon his election (injecting urgency – temporal reframing). Reframed as such, an enabling environment for private investment in the sparsely-populated Northeast Region may have seemed an inadequate strategy for achieving rapid electrification. Publicly-funded PV systems would be more viable within this problem-definition. Pilot installations were successful [51] so it may have been attractive to extend the Programme to many other off-grid facilities.

5. Discussion

For many years, niche actors' market-failure narrative helped win resources from neoliberal donors for realising, paradoxically, developmental niche-building. State actors' indifference to PV reflected a knowledge-gap narrative. From the late 1990s, niche and state actors worked more closely together and converged on an enabling-

environment narrative they continue to espouse, although this may be a strategic move rather than genuine belief. In any case, there have been material and institutional changes. We discuss aspects of these changes below while answering the research question "how have interactions between global development actors, national policymakers and local practitioners influenced material development of the Kenyan PV market?"

Some material and institutional changes have benefited niche-building, whilst the implications of others remain uncertain. For example, the market-failure narrative won resources for technology and micro-finance experiments, establishing infrastructure, expanding actor-networks, nurturing capabilities, and more. However, these niche-building gains depended on direct donor-funding. Whether promotion of an enabling-environment narrative will succeed in winning donor-resources is uncertain. Plausibly, niche actors may simply surrender to "disciplinary neoliberalism" [22], losing 'developmental' niche-building resources [cf 23, regarding Mozambique's constrained developmental space]. Alternatively, disciplinary neoliberalism may not triumph unproblematically. Neoliberal development actors have been contradictory: they have resourced developmental niche-building even while espousing enabling-environment orthodoxy.

Although the state has become more niche-friendly, little material gain has resulted. The state's enabling-environment narrative may be simply cosmetic, signalling PV-support while avoiding public funding commitments for technology it does not take seriously. It is unclear whether serving the off-grid population furthers the state's own interests more effectively than serving grid-connected citizens and large industrial users. Newell and Phillips [22], for example, argue that the Kenyan state is more favourable to geothermal electricity than off-grid PV because it benefits powerful grid-connected users. Donors, too, are supportive of geothermal because it avoids greenhouse gas emissions whilst providing a large increase in generating capacity. The state's preference for geothermal power is a risk for PV niche actors. Hard-won gains in the niche could wither if resources are directed away from niche-building towards geothermal interests, especially if an enabling environment is primarily about creating profitable investment opportunities.

The existence of the IPVSP suggests conjecture that the state's enabling-environment narrative is cosmetic may have some basis. Speaking generally, when developing-country governments can direct their own resources they can ignore neoliberal orthodoxy. In the Kenyan case, the IPVSP may be reaching the poor most directly with electricity services, in contrast to creating conditions within which profit-seeking actors will sell those services. Kenya is not the poorest developing country but the IPVSP illustrates that, where the state can mobilise its own resources, there may be opportunities for some form of developmentalism.

Whatever form developmentalism may take, its mobilising narrative is unlikely to determine development outcomes. Instead, as our case shows, a developmental niche is embedded in a web of relations; it is not a self-contained protective experimental space. We have observed the dynamics of these relations, showing how global and local forces interact relationally to co-produce development strategies. In effect, we treated the state and international development regime as "a dispersed ensemble of institutional practices and techniques of governance" [108, p. 14], revealing the messy realities of policymaking and implementation in which different actors seek to realise their preferred development pathways through negotiation of complex socio-political relations [25].

Actors certainly deploy their material power in attempting to shape pathways and so the most powerful will likely dominate. In the Kenyan case, the convergence on an enabling-environment narrative signals that neoliberal orthodoxy may be disciplining the niche, and neoliberal development actors have the material power to enforce their will. They decide which market development interventions get funded. The recent enabling-environment narrative could backfire on niche actors if it is enacted in its 'purest' form. Both the enabling-environment and earlier market-failure narratives obscure the importance of the collective, relational and systemic phenomena crucial to nurturing innovation and social change. Celebrated, instead, are atomistic notions of heroic individuals and deterministic technologies. The complexities of politics, culture and social practice, for example, are reduced to barriers that must be overcome so that (heroic) entrepreneurs can harness free-market forces to deliver technical fixes for social injustices.

Recalling our discussion in Section 2 on distinguishing between a niche and a market, we can reflect on what 'pure' implementation of neoliberal orthodoxy might mean for the Kenyan niche. So far, the niche is a space in which a growing actor-network has built increasingly sophisticated indigenous socio-technical PV capabilities. The resulting economic and human benefits of a flourishing PV market have contributed to Kenya's development needs. But if effort focusses narrowly on an enabling environment that only promotes a PV market – the exchange of money for PV equipment and services – the niche could wither even as the market flourishes. The market is attracting a growing number of international actors, including those in international finance. Such international engagement may become increasingly extractive, leaving only the least valuable parts of the supply chain to local actors. While many Kenyans would benefit directly from the solar artefacts sold in the market, a withering niche could yield increasing control to international finance and technology players, risking further disciplinary neoliberalism [22].

This outcome is not guaranteed. The actual unfolding development pathways will result from the messy realities of policymaking and implementation, negotiated through complex socio-political relations. And so-called neoliberal policy actors can be developmental in practice. However, as we argued at the beginning of this paper, the instruments of the global SDG and climate change agreements operationalise neoliberal orthodoxy. So, whilst development pathways will not emerge deterministically in different contexts, the balance of power lies with neoliberal orthodoxy, creating uncertainty over whether niche-building resources will be available or if they will flow according to the vagaries of the market. From our analysis, we would argue that global agreements must relax the grip of neoliberal orthodoxy and instead secure resources for developmental approaches such as niche-building.

6. Conclusions

Global agreements on energy and climate are framed in neoliberal terms, but national-level realities in developing countries require developmental approaches if these agreements are to be achieved. As large quantities of finance flow to projects that realise these agreements, the number of contested neoliberal-developmental encounters will likely multiply. In this paper, we examined the evolution of Kenya's PV market, which has a long history of interaction between neoliberal policymakers and local 'developmental' actors, providing a useful case for illuminating the realities of such encounters. We focussed on a selection of key moments in this history to analyse how neoliberal-development encounters have shaped the PV market's evolution. In doing so, we made three main contributions.

First, as a theoretical contribution, we developed a 'niche political economy' framework, drawing from discursive institutionalism synthesised with strategic niche management. This connected discourse, power, institutional change, and materiality, all interacting in a development context in which different visions for pro-poor low-carbon energy access are competing for dominance. Second, as an empirical contribution, we showed how actors within the Kenyan PV niche, the Kenyan state and the neoliberal development regime have acted strategically in their mutual encounters as they have sought to promote their own preferred energy-development pathways. And, third, more generally, we contributed to debates about the messy realities of policymaking in particular places, suggesting we should be cautious about assuming the deterministic power of neoliberalism.

Finally, our analysis suggests there are uncertainties for achieving global energy and climate ambitions; uncertainties arising from the tensions between neoliberal and developmental approaches. Pessimistically, neoliberal rhetoric may result in dwindling resources for sustainable energy niche-construction while promoting the expansion of the most predatory forms of neoliberal capitalism. Optimistically, despite neoliberal rhetoric, we see even the centres of neoliberal orthodoxy practising in ways that could strengthen niches of pro-poor sustainable energy access, meaningful climate change action and perhaps socially-just transformations.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.erss.2018.03.028.

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